1088

THERMOCOUPLE

SIMULATOR/CALIBRATOR

TECHNICAL MANUAL

MP MASTER
MA24397

1088

THERMOCOUPLE

SIMULATOR/CALIBRATOR

All Time Electronics' instruments are subject to continuous developement and improvement and in consequence may contain minor detail changes from the information contained herein.

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Version 2.1

1088 TECHNICAL MANUAL CONTENTS

1. GENERAL DESCRIPTION 4
2. SPECIFICATIONS 6
3. GENERAL OPERATION NOTES . 10
4. OPERATING INSTRUCTIONS . . 12
5. FRONT PANEL CONTROLS . . . 20
6. BATTERY REPLACEMENT . . . 22
7. CALIBRATION 24
8. GUARANTEE 28
9. SPARE PARTS LIST 30

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1. GENERAL DESCRIPTION

The 1088 is a portable battery powered instrument capable of reading or simulating 7 types of thermocouple and reading or simulating micro/milli volts.

Thermocouple temperatures and voltages required are entered on the splashproof keyboard and displayed on a 16 character L.C.D. dot matrix display.

The thermocouple voltage can be displayed as either a temperature in Centigrade or Fahrenheit or converted into its equivalent voltage.

Automatic or manual cold junction compensation can be selected and applied.

Frequently used values may be stored in the memory to speed up repetitive testing.

The unit is powered from 6 'AA' type cells (preferably Ni-Cad cells) which give approximately 12 hours operation. Recharging of the Ni-Cad cells is possible without removal from the carry case.

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2. 1088 SPECIFICATIONS

ACCURACY - MEASURE :

THERMO. TYPE	TEMPERATURE RANGE °C	ACCURACY °C
J	-200 to 590	0.4
K	-270 to -150	2.5
	-150 to 780	0.5
T	-200 to 400	0.4
R	-50 to 400	1.5
	400 to 1750	1.0
S	-50 to 100	2.0
	100 to 1750	1.0
B	50 to 1000	2.5
	1000 to 1800	1.0
E	-100 to 400	0.3

Resolution = 0.1 °C

ACCURACY - SOURCE :

THERMO. TYPE	TEMPERATURE RANGE °C	ACCURACY °C
J	-210 to 200	0.1
	200 to 1200	0.4
K	-270 to -200	1.0
	-200 to 600	0.25
	600 to 1250	0.5
T	-200 to 400	0.3
R	-50 to -20	1.5
	-20 to 800	0.5
	800 to 1750	1.5
S	-50 to -20	1.0
	-20 to 500	0.5
	500 to 1750	1.5
B	0 to 1300	0.5
	1300 to 1800	1.3
E	-100 to 1000	0.3

Resolution 0.1°C

COLD JUNCTION TEMPERATURE COMPENSATION

0.02°C/°C + 0.1°C

MILLIVOLT OUTPUT SPECIFICATIONS

0 to +/- 8.192mV

Resolution	2uV
Accuracy of Setting	0.05%
Accuracy of Range	0.02%

8.192mV to 81.92mV

Resolution	20uV
Accuracy of Setting	0.05%
Accuracy of Range	0.02%

All Accuracies +/- 1uV.

MILLIVOLT MEASURE SPECIFICATIONS

0 to +/- 32mV

Resolution	8uV
Accuracy	0.05% + /- 8uV

OPERATING TEMPERATURE

0°C to 40°C.

CONNECTIONS

4 off 4mm Terminals.

1) GREEN/YELLOW	CASE
2) RED/BLACK	INPUT
3) BLACK	COMMON
4) RED	OUTPUT

POWER REQUIREMENTS

The 1088 is powered by 6 X 'AA' size batteries. Rechargeable batteries may also be used with a suitable mains charger via the charging socket on the end of the unit.

BATTERY REPLACEMENT

See section 6 for battery replacement.

CONSTRUCTION

The case is of metal construction finished in two tone blue and black.

CARRY CASE

The 1088 is supplied in a robust carry case with an internal pocket for instruction manual and test leads etc. Full operation, including recharging of the batteries, is possible without removal from the case. The lid is reversible to facilitate operation.

DIMENSIONS (in the carry case)

235 X 150 X 75mm, 1.3Kgs.

3. GENERAL OPERATION NOTES

When using the 1088 to calibrate direct reading temperature measuring instruments, it is important to remember that the measuring instrument will in most cases automatically apply cold junction compensation.

Cold Junction temperature compensation enables absolute temperature measurements to be made when the connection end of the thermocouple (Cold Junction) is not at 0°C.

For accurate calibration, the Cold Junction temperature used by the 1088 must be the same as the value being applied by the measuring instrument.

The 1088 can automatically apply Cold Junction compensation using its own internal temperature sensor. This temperature, which can be displayed by pressing the 'AUTO C.J.' key, may differ from the measuring instruments Cold Junction temperature. In these circumstances a manual Cold Junction temperature must be used. (See Section 4, Entering a manual cold junction Temperature.)

The temperature measuring instrument can be made to display its own Cold Junction temperature by shorting the thermocouple input connections.

NOTE : To minimise errors when moving the 1088 between different ambient temperatures, a period must be allowed for the cold junction temperature to stabilise.

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4. 1088 OPERATING INSTRUCTIONS

SIMULATING A THERMOCOUPLE.

When the unit is turned on, it displays the PROM version number and then displays :

This indicates that the 1088 is ready to simulate a type 'K' thermocouple in °C and apply automatic cold junction compensation.

Connect the 1088 to the temperature measuring instrument with copper leads, thermocouple leads or compensation cables.

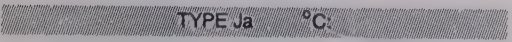
Check to see if manual cold junction compensation is required. Usually this is if the measuring device is at a different temperature from the 1088. See section on 'Entering a Manual Cold Junction Temperature'.

SELECTING A DIFFERENT THERMOCOUPLE TYPE.

a) Press 'SHIFT' key - display shows :

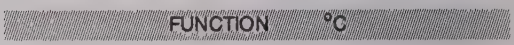
b) Press the required thermocouple type key (in red).

Example - TYPE J - display shows :

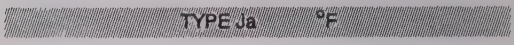


SELECTING °F OPERATION (IF REQUIRED).

a) Press 'SHIFT' key - display shows :



b) Press (°C/°F) : display shows :



ENTERING A MANUAL COLD JUNCTION TEMPERATURE. (If Required).

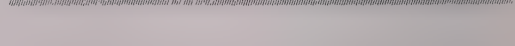
a) Press 'SHIFT' - display shows :

b) Press 'MAN CJ' - display shows :

c) Enter the C.J.C. (Cold junction compensation) temperature required and press 'ENTER'. Display shows :

(where NN.N is entered value). The new value is now compensating for the cold junction temperature of the measuring instrument.

To return to the automatic C.J.C press the AUTO C.J. key. The display shows :



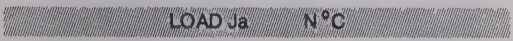
Where NN.N °C is the current value for C.J.C. that the 1088 is using.

The letter after the thermocouple type on the display shows the type of compensation selected. Either 'a' for automatic or 'm' for manual compensation.

SIMULATING A THERMOCOUPLE OUTPUT.

a) Enter the temperature required.

Note : Display changes when the first digit is pressed.



(N is digit pressed).

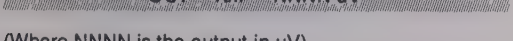
b) When the value on the display is correct, press (ENT). Incorrect values can be removed by pressing (CLR). Display shows :

(N.NN is value entered) or

if the value was out of the instruments range.

DISPLAYING THE OUTPUT IN uVOLTS (If Required).

a) Press 'CONVERT'. The display shows :



(Where NNNN is the output in uV).

b) Press 'CONVERT' to return to the original display.

SELECTING MICROVOLT OUTPUTS.

a) Press 'SHIFT'. Display shows :

b) Press 'uV' . Display shows :

c) Enter the required output in uV.

Note : The display changes when the first digit is pressed to :

where N is digit pressed.

d) When the value required is on the display, press 'ENT'. Incorrect values can be cleared with the 'CLR' key. Display shows :

where NNN is the entered value or -

if the maximum output of 81900uV is exceeded.

SELECTING MILLIVOLT OUTPUTS.

Follow the previous steps, substituting the mV key in place of the uV key. Output is now in mV.

STORING AND RECALLING TEMPERATURES, mV AND uV VALUES IN MEMORY.

STORING VALUES

a) Select thermocouple type or uV/mV and dial in value. DO NOT press the enter key.

b) Press the 'STORE' key when the required value is displayed.
Display shows :

LOCATION ?

c) Press a digit between 0 and 9 to select a memory location.

Display returns to normal mode.

RECALLING VALUES.

a) Press 'RECALL'. Display shows :

LOCATION ?

b) Press a digit between 0 and 9 to recall a value stored in that location. - display shows :

OUT> NNNN

where NNNN is the stored value.

If no value has been stored in that location the default output of 0°C for a type K thermocouple will be recalled. Recalled values are output immediately.

STEPPING THROUGH THE MEMORY LOCATIONS.

a) Recall the first value required.

b) Press 'STEP' to select next memory location. An ERROR display will be given if a memory location greater than 9 is selected.

NOTE : The 1088 contains a volatile memory. It will lose all values stored as soon as the power is turned off.

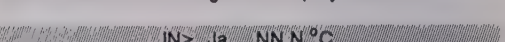
MEASURING A THERMOCOUPLE OUTPUT.

MEASURING AS A TEMPERATURE

a) Select the appropriate thermocouple type.

b) Press 'MEASURE' key. Display shows :

When measurements begin the display shows :



If the value is out of the 1088 range the display shows:

c) To exit from measure mode hold the 'SHIFT' key down until display shows :

Then select the next operation.

MEASURING IN uVOLTS.

Select uV mode and then select 'MEASURE'. Display shows :

```
MEASURE
```

When measurements begin the display shows :

```
IN > u   NNNNuV
```

Where NNNN is reading in uV.

If the value is out of the 1088 range (MAX 32760uV) the display shows :

```
OVERRANGE
```

MEASURING IN mVOLTS.

Select mV mode and select measure as above. The display shows :

```
IN>  m   NN.NNNmV
```

EXITING FROM THE MEASURE MODE

Hold down shift key until display shows :

```
FUNCTION
```

Then select the next operation.

GENERAL NOTE

If

BATTERY LOW

flashes on the display whilst using the 1088, it indicates that there is an hour or so life left before the unit needs new batteries or recharging, alternatively if :

BATTERY FLAT

shows on the display, this indicates that new batteries must be fitted or that the unit must be recharged before any more operations are permitted.

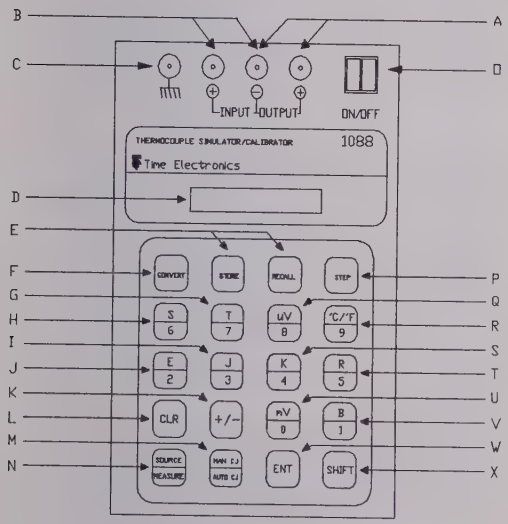
RECHARGING NI-CAD BATTERIES

NOTE : Only Ni-Cad batteries can be recharged.

This should be performed with the instrument turned off and takes about 12 hours for a full recharge. The unit may however be left on charge for up to a week without damage to the internal rechargeable cells. A short charge for an hour will usually give a couple of hours operation. The 1088 can also be recharged from the 'cigar lighter' in a car using a special recharger lead.

Operation of the 1088 is permitted whilst charging the batteries.

5. 1088 FRONT PANEL CONTROLS



A) Output Terminals.

B) Input Terminals.

C) Chassis connection.

D) 16 digit Liquid Crystal Display.

E) Stores a value to the memory or recalls an output value stored in the memory.

F) Converts the output temperature into the equivalent uV value.

G) When shifted selects a type T thermocouple.
H) When shifted selects a type S thermocouple.
I) When shifted selects a type J thermocouple.
J) When shifted selects a type E thermocouple.

K) This selects either a positive or negative output.

L) Clears a value entered on the keypad.

M) Selects either Manual Cold Junction compensation or Automatic Cold Junction compensation.

N) Selects either Source or Measure mode.

O) This rocker switch turns the 1088 on and off.

P) Steps to the next value stored in the memory and sets the output.

Q) Selects uV output when shifted.

R) Toggles the temperature unit between Centigrade and Fahrenheit when shifted.

S) Selects type K thermocouple when shifted.
T) Selects type R thermocouple when shifted.
U) Selects mV mode when shifted.
V) Selects type B thermocouple when shifted.

W) Enters a value for output.

X) SHIFT selects functions on keypad in red.

6. BATTERY REPLACEMENT

When turning the unit on, the display will show :

If the batteries need replacing or recharging the display will show :

indicating that only an hours life is left in the batteries or

indicating that the batteries can no longer be used.

Either charge the batteries if Ni-Cad cells have been fitted or replace with a full set of new batteries.

Remove the 1088 from the carry case and unscrew the three screws in each side of the case. Remove the case, access is now given to the battery holders. Batteries can now be replaced observing polarity. It is recommended that rechargeable batteries are used wherever possible.

The batteries used are 6 X AA size 1.5V.

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7. 1088 CALIBRATION

The 1088 has an automatic calibration mode which will set the correct output for each test. The unit will then step through a linearity checking routine.

This mode is selected by pressing the 'RECALL' key when turning the power on. The 1088 will display -

```
TEST MODE
```

Press 'RECALL' and enter location zero.

The unit will display -

```
OUT>  u   0uV
```

Pressing the 'STEP' key will step to the next calibration point and pressing the 'STORE' key will return to the previous test.

The first adjustment to be made is to set the zero.

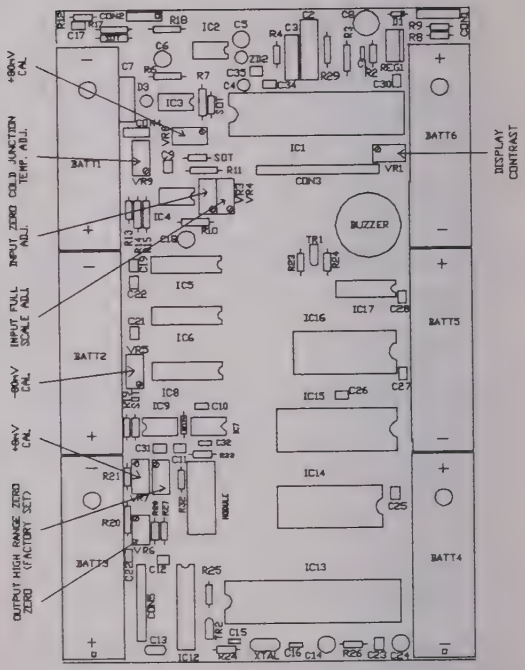
When the output is set to 0uV in the source mode, adjust VR6 to give an output of 0uV.

Press 'STEP'. The output is now set to -80000 uV. Adjust VR5 to give -80000uV output.

Press 'STEP'. The output is now set to +80000 uV. Adjust VR8 to give +80000uV output.

Press 'STEP'. The output is now set to +8000 uV. Adjust VR7 to give +8000uV output.

The unit will then step through a linearity test which tests 20 points ranging from +80000uV to -80000uV.



Once the linearity has been checked, the 1088 will then step through all the thermocouple types, setting the output to various points. This will enable the thermocouple simulation to be checked using the appropriate conversion tables.

The measure mode of the 1088 must now be calibrated.

Select the microvolt measure mode and short circuit the input terminals. Adjust VR3 to read 0uV on the display.

Remove the input short and connect a voltage calibrator set to 30 mV across the input terminals and adjust VR4 so that the display reads 30000 uV.

Remove the calibrator.

SETTING UP THE COLD JUNCTION TEMPERATURE

This procedure may only be performed in a stable environment, away from draughts and other sources of heat or cold.

Allow the instrument to acclimatise to the ambient temperature.

Press the AUTO C.J. key and read the display. Adjust the reading displayed to correspond with a standardised thermometer using VR9. After each adjustment press the AUTO C.J. key to display the new reading.

Allow the instrument to settle again and recheck the reading.

The calibration of the 1088 is now complete. The display contrast may also be adjusted if required using VR1.

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8. GUARANTEE

The 1088 is guaranteed for a period of 12 months from its delivery date to the purchaser, covering replacement of defective parts.

We maintain comprehensive after sales facilities and the instrument can, if necessary, be returned to our factory for servicing. The type and serial number of the instrument should always be quoted together with full details of any fault and the service required. The service department can also provide maintenance and servicing information by telephone, fax or letter.

Equipment returned to us for servicing or repair must be adequately packed, preferably in the box supplied, and shipped with transportation charges prepaid.

WE CAN NOT ACCEPT RESPONSIBILITY FOR INSTRUMENTS ARRIVING DAMAGED.

Should the cause of failure during the guarantee period be due to misuse or abuse to the instrument or if the guarantee has expired, the repair will be put in hand without delay and charged unless other instructions are received.

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9. SPARE PARTS LIST

PART NO	ORDER CODE
FRONT PANEL SWITCH LABEL	2583
1088 TECHNICAL MANUAL	2738
TERMINALS - 2 RED	6209
TERMINALS - 1 GREEN	6210
TERMINALS - 1 BLACK	6211
RECHARGE SOCKET	6231
ON/OFF SWITCH	6398
LCD DISPLAY	7223
RECHARGEABLE BATTERIES	7625
CARRY CASE	9003
MODULE	9527

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